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Environmental Planning and Decision Making A Case Study

Risø-R-731(EN)

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January 1994**

Abstract This report focuses on the environmental decision-making process as it takes place on a national level. Two recent examples on environmental planning have been the starting points for the report: The Danish Water Action Plan, which was ratified in 1987, and the Dutch National Environmental Policy Plan, ratified in 1990.

The starting points for the two plans are outlined and the processes themselves are described using the accessible literature. The complicated political ratification processes which led to the plans were exposed to many questions. The various critique points are discussed and utilised as a basis for identifying three different types of uncertainty: technical, structural, and sociopolitical, as well as different uncertainty factors (called elements) that lead to uncertainty and contribute to unpredictable events in the decision processes.

An alternative planning procedure has been proposed from this description. This procedure gives an overview of how a specific environmental problem can be identified and structured from the presentation of the problem until a strategy has been found for solving it. The principles behind the planning procedure are based on first establishing an overview of the problem and its relation to similar problem areas, and based on this knowledge establish a long-term plan which provides options for frequent modifications and smaller changes of the strategies as new information becomes available. Consequently, the planning becomes an expression for both long- and short-term goals which can be modified following the dynamics of the society. Uncertainties of technical or structural type can be handled through these aspects while the more sociopolitical uncertainties can be only partly dealt with.

It is the conclusion of the case study that environmental planning on a high political level involves many uncertainty elements that require attention if the political decision-making process shall continue to be well respected. Simultaneously, it is clear that the usage of computer models for supplying basic information to the decision makers can indirectly influence the political context and raise parliamentary problems.

The present report represents the second part of the Ph.D. dissertation "Environmental Planning and Uncertainty" submitted to the Technical University of Denmark, Lyngby, Denmark. The defence took place 17 November 1993.

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Abstract (in Danish) Denne rapport fokuserer på beslutningsprocessen for miljøplanlægning, som den udføres på et nationalt niveau. Der er taget udgangspunkt i to eksempler på nyere miljøplanlægning: Den Danske Vandmiljøplan, der blev vedtaget i 1987, og den Hollandske Nationale Miljøplan, der blev vedtaget i 1990.

Optakten til de to beslutningsprocesser er skitseret, og selve processerne er beskrevet ud fra den tilgængelige litteratur. Tilblivelsen af planerne var en kompliceret proces, hvor der er blevet sat mange spørgsmål overfor den politiske beslutningsproces. De forskellige kritikpunkter er diskuteret og brugt som udgangspunkt for at identificere forskellige typer af usikkerhed, teknisk, strukturel og samfundspolitisk usikkerhed, samt nogle faktorer (elementer) der har været årsag til usikkerhed og dermed har bidraget til uforudsigelige hændelser i beslutningsprocesserne.

Ud fra beskrivelsen af planerne er der foreslået en alternativ planlægnings-procedure. Den giver en overordnet struktur for, hvorledes et miljøproblem kan identificeres og struktureres, fra det præsenteres, til der er fundet en strategi for løsning af dette. Principperne for planlægningsproceduren er baseret på at først etablere et overblik over problemet og sammenhænge til andre problemområder og ud fra denne viden fastlægge en langsigtet plan, med muligheder for hyppige modifikationer og mindre ændringer af strategier, som ny viden bliver tilgængelig. Hermed bliver planlægningen et udtryk for både langsigtede og kortsigtede målsætninger, der kan modificeres i takt med samfundets dynamik. Usikkerheder, der er af teknisk eller strukturel karakter, kan dermed håndteres på forskellig måde. De mere samfundspolitiske usikkerheder kan kun håndteres til en vis grad.

Det er konklusionen af dette case studium, at miljøplanlægning på et højt politisk niveau er udsat for mange usikkerhedselementer, der på en eller anden måde må håndteres, hvis den politiske beslutningsproces skal bevare sin styrke. Samtidig er det ligeledes klart, at brugen af computermodeller til at give supplerende basisinformation indirekte kan give parlamentariske problemer.

Nærværende rapport repræsenterer anden del af ph.d.-afhandlingen "Miljøplanlægning og Usikkerhed", som er blevet udført ved Danmarks Tekniske Højskole, Lyngby, Danmark. Forsvaret foregik den 17. november 1993.

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Preface

The present report describes a case study which illustrates the complexities in practical environmental planning and decision making taking place at a national hierarchical policy level. The study focuses on the ratification processes of two environmental plans through their description and comparison in terms of the points which are raised or could have been raised regarding the uncertainty about the outcome of the processes.

This report forms the second of three parts of the Ph.D. dissertation on "Environmental Planning and Uncertainty". The present report shall be seen as one of two case studies performed as part of the dissertation. It shall be viewed as an individual report, but at the same time an important part of the entire dissertation. In order to avoid too many repetitions of definitions of words, phrases, etc., cross-references are made to the other two parts of the dissertation. It is my hope that this will not affect the readability of the present report.

The work has been performed at Risø National Laboratory during the period from 1991 to 1993.

Lene Sørensen
Roskilde, January 1994

1 Introduction

Within the last decades, environmental issues have set their marks on the political agendas of most countries. The political milieu in which environmental decisions are made is forced to follow the tact of the local, national, and international communities that seek influence through, e.g., intensive lobbying, protest activities, green movements, and media campaigns. The intensive pressure sets demands on the effectivity of the environmental decision-making agenda as well as on the scientific context that provides support and information. Decisions have to be made irrespective of the level of conflicts and knowledge concerning causes and effects—and irrespective of the lack of methodological aspects for approaching these issues.

This report directs the problems of environmental decision-making through studies of two cases: the ratification of the Danish Water Action Plan, and the ratification of the Dutch National Environmental Policy Plan. The overall goal of the present report is to identify elements (the so-called uncertainty elements) which in some way may influence the structure and outcome of a decision process. Additionally, it is my aim to suggest ways in which these uncertainty elements can be handled through a structured decision-making process.

We begin by describing the two ratification processes. The first and most extensively covered is the Danish Water Action Plan (ratified in 1987). The plan was an attempt to comply with the increasing effects of water pollution seen in Danish waters. The problem-solving process used in developing the plan was in some reports so outstanding that it almost caused the fall of the minority government. In other respects, it is only one example of similar processes that take place on low and high levels of decision making. The spending of 12 billion Danish kroner on an environmental plan, and the way the problem was presented to the public received a great deal of attention again creating a process which seemingly was ruled by a series of more-or-less random factors.

The second example is the Dutch National Environmental Policy Plan (agreed upon in 1990). This plan aimed at solving all current and future environmental problems in the Netherlands by developing a large integrated plan (here the word “integrated” relates to the fact that the plan describes actions to be taken in more than one sector, and deals with all larger environmental problems in the Netherlands at the same time). This plan is unique first of all in its innovative approach to environmental planning, and secondly because it was the first time in Europe a government fell on an environmental issue.

Both plans illustrate the large controversies and uncertainties that arise in environmental decision making. Focusing on the various elements of uncertainty that are inherently in both decision-making processes, they have been the basis for suggesting a systematic approach for developing environmental plans. The theoretical lines for this suggestion are based on the literature and the experience gained in working with environmental planning and has, therefore, not been tried out in practice.

The report is outlined as follows:

Chapter 2 describes the Danish Water Action Plan in connection with the decision-making process, formulation of demands, solutions, and resolution. Furthermore, the contents of the plan are presented briefly, confined to points in the plan which have been criticized and discussed in public after the resolution. This critique will also be addressed and commented upon in this chapter. Additionally, *Chapter 2* deals with the prospects for implementing the plan, and outlines what has been done in the period 1987 through 1993. Some of the complexities, uncertainties, and obstacles in environmental decision making are

also described.

The Dutch National Environmental Policy Plan is presented in *Chapter 3*. It is the second example of a public national environmental plan. A description of the decision-making process is presented along with the contents of the plan. These contents have been given special attention since they illustrate sound principles of dealing with uncertainties. Lastly, problems related to implementing the measures of the plan are commented upon.

In *Chapter 4*, the two plans are compared relevant to their aspects of uncertainty. Three broad types of uncertainty can be identified in the development and formulation of the plans: technical, structural, and sociopolitical uncertainty. The two plans are compared in terms of how they have handled the many elements of uncertainty that arise.

Methodological aspects to formalise environmental planning and decision making are discussed in *Chapter 5*. A framework is suggested for how environmental planning could be systematised and at the same time cope with some of its many inherent uncertainties. This results in the so-called “Two Level Planning Approach”.

Finally the conclusions are presented in *Chapter 6* along with open questions arising from the study.

It should be mentioned that in the description of the decision-making processes resulting in the two environmental plans, names of persons, political parties, companies, etc., are not given explicitly (except in only a few cases). It is the process as such that has been the focus of this study, and it is not the intension of this report to pinpoint the actors of the processes.

2 The Danish Water Action Plan

The events which resulted in the Water Action Plan will be outlined in this chapter. The decision-making process that led to the plan was initiated at the beginning of the 80s and intensified in 1986 and 1987. Evaluations of the plan made in 1990, raised an open debate where causes, consequences, and strategies for water planning were discussed and heavily criticized. In that connection, several reports and books have been published (see for example, ATV, 1990, Røjel, 1990, and Andersen and Hansen, 1991). In the publications, the plan was questioned, and the publications taken together outline a large number of factors influencing the process that resulted in the plan: the parliamentary political situation and its traditions; the role of the media; the role of the scientists; uncertain scientific figures, etc., etc.

This chapter describes the decision-making process as it took place, a few points in the plan, and finally outlines some of the criticisms raised against the plan. The chapter is mainly based on Sørensen and Vidal (1991), ATV (1990), Røjel (1990), and Andersen and Hansen (1991).

In Denmark, the first approach to regulating the domestic environment was passed in 1973. It was called "The Danish Environmental Protection Law" and represented a framework upon which regulations were to be made. No specific guidelines or standards to secure a certain level of environmental quality were listed. It was intended that such guidelines should be issued upon negotiations between the ministerial Environmental Protection Agency. They involved interested parties upon whom the specification of the guidelines was aimed. It became a complicated system involving continual negotiations, and discussions between institutions that represent different public sectors and scientific and technical experts on one side, and the political arena on the other (Andersen and Hansen, 1991). The control and regulation of the specific issue of water pollution were placed upon the municipalities. The agricultural sector was not included under the Protection Law, since it was argued that there was insufficient knowledge on environmental impacts caused by fertiliser usage, and that standards or economic regulations (user fees) would harm the agricultural sector. The system was largely characterized by a slow negotiation procedure and consensus solutions accomplished by a few representatives, and officials from the government, and highly placed representatives from large interest organisations (Andersen and Hansen, 1991). The parliamentary circumstances were stable and there was a large public reliance on the state administration (Andersen and Hansen, 1991).

Through the 70s and the beginning of the 80s, this situation reversed. The political situation changed as a result of a newly set minority government—a government highly influenced by conflicts among the various ministries (Andersen and Hansen, 1991). Grassroot movements gained success with the public by setting simple suggestions and succeeding to a certain extent on preventing the carrying out of resolutions. The situation among experts in the Environmental Agencies was influenced by mutual competition, individual target setting, and lack of cooperation. This situation initiated a mistrust among the public towards "the experts". Simultaneously several cases of local pollution were discovered, requiring regulation (Andersen and Hansen, 1991).

This was the eco-political situation until the initiation of and through resolution of the Danish Water Action Plan.

2.1 Description of the Decision-making Process

Throughout the 80s, Denmark experienced an increase in pollution resulting in oxygen losses, and fish death in large parts of the Kattegat. Research programmes were initiated to determine the causes of the problems.

In 1984, it was concluded that the pollution and its related effects were due to runoff, and discharges of nitrogen, phosphorous, and organic compounds coming predominantly from agriculture, and domestic and industrial sewage.

In 1985, the Government and a Danish Parliamentary majority agreed on a plan: The NPO Review (Nitrogen, Phosphorous and Organic compounds) (Miljøstyrelsen, 1984). Its key point was providing a list of specifications on how farmyard manure should be stored. The plan involved investments in the agricultural sector of about 1.5 billion Danish kroner. In recognition of the limited knowledge about causes, effects, and relationships, mainly between the farmyard manure and water pollution problems, research programmes were initiated. The primary aim of these programmes was to give an integrated description of the transport of fertilisers, and farmyard manure from a farmhouse to the sea. In this way, it was expected that researchers, planners, and decision makers would get a better understanding of the complicated chemical processes in the ground, and be able to assess effects on the water system. The programme was to be carried out during the period 1986 to 1990, at which time a concluding report was to be published. Problems concerning the decrease of oxygen in Danish waters were recognized, and plans to regulate them were put into practice.

Outside the walls of the Ministries and Parliament, people looked upon environmental issues with growing concern. In 1986, an opinion-poll showed that Danish citizens considered protection of the environment as foremost in terms of issues confronting representation of the society. A trend was seen as an effect of the 1985 municipality election, namely the so-called green parties in councils (Andersen and Hansen, 1991). Furthermore, experiences from Germany showed that the green movements could become a factor with great power to threaten traditional political structures. The political situation in Denmark was at this time relatively complex. The government was a minority government consisting of three parties, plus a fourth party which was free to support the opposition in single questions. The green trend influenced the profiles of the parties. Especially, the smallest party within the government (which would be in danger of not being represented in Parliament in the event of a new election) and the opposition felt a strong urgency to present a green profile to the public.

Initiation of the decision process which resulted in the Water Action Plan was realized on the 8th of October 1986. That day Danish television displayed photographs of dead lobsters caught in the Kattegat. The pictures were segments of a report covering water pollution problems and were sent in the news television programme. Water pollution problems became apparent to almost every Danish citizen. The incident created a public demand that the Danish Government take action. This decision process consisted of three phases: formulation of demands, formulation of a solution, and resolution of the Water Action Plan.

In Table 2.1, some of the most important dates and events in the decision process are depicted.

2.1.1 Formulation of Demands

In the following weeks after the television report on water pollution problems, the pictures of the dead lobsters were shown repeatedly, and appeared on TV headline news more than 20 times.

Table 2.1. Important dates and events in the decision process.

Dates	Events
Formulation of demands	
8 October 1986	Pictures of dead lobsters showed on Danish television.
11 October 1986	Resolution from Organization for Conservation of Nature. Request for immediate action.
19 October 1986	Meeting on Danish television between representatives from the Government and the above mentioned organisation. The 6-point-plan was presented.
28 October 1986	The Danish Environmental Ministry published "Action Plan for the Seas Surrounding Denmark".
12 November 1986	Public meeting in Organisation for Conservation of Nature. Modification of the 6-point-plan.
18 November 1986	Resolution in the Danish Parliament which imposed on the Government to: a) stop illegal discharges from wastewater treatment plants and agriculture before 1st May 1987, and b) make a plan which included instructions to investments and actions resulting in a reduction of nitrogen and phosphorous discharges by 50% and 80%, respectively.
Formulation of a solution	
November – December 1986	Preparation of a plan. Meetings in the Government and in a group of experts.
Resolution of the Water Action Plan	
18 February 1987	Plan presented and agreed on in the Parliament.
14 April 1987	Consensus Conference
10 June 1987	Final resolution of the plan. Planning an evaluation of the plan in 1990.

Shortly after reporting the dead lobsters occurring in the Kattegat, a large Danish environmental organisation (Organisation for Conservation of Nature or Danmarks Naturfredningsforening, privately sponsored and with no link to political parties, industry, or trade unions) held a meeting and put forth a resolution that requested that immediate action be taken by the authorities to

reduce nutrients (mainly, nitrogen and phosphorous compounds) coming from wastewater and runoff (farming). The organisation's director was interviewed several times on television where its views on the issue were expressed.

Eight days following publication of the resolution, representatives from the Government and the above-mentioned organisation met in debate on a television news programme. Some believe (for example Røjel, 1990) that the Government representative considered this to be a good opportunity to make publicity for an environmental party programme that would be presented within a few weeks. The representative from the environmental organisation had other intentions for the outcome of the debate. He had been promised 90 seconds by the TV station to present a recently made plan: the so-called 6-point-plan (Danmarks Naturfredningsforening, 1987). This plan consisted of 6 very precise, and easy-to-understand points stating the causes for the death of the lobsters, and demanding action to improve the Danish surface waters. Reducing nitrogen and phosphorous discharges from industry and domestic sewage, and lessening runoff from agriculture were key points in the plan. Furthermore, suggestions were given for financial solutions as well as a time limit for implementing the plan. The Government representative was taken by surprise and promised Governmental action and a plan to put the actions into effect within 2 months.

In the days that followed, other persons from the Government attempted to withdraw the promise. Outside the Government, other parties from Parliament and representatives from the Environmental Protection Agency (which is an institution under the Danish Environmental Ministry) expressed their support of the 6-point-plan. But agricultural organisations and farmers were opposed to it. They believed that it focused too much on agricultural runoff and discharges even though the knowledge about their environmental effects was admitted to be limited.

The Danish Environmental Ministry published "Action Plan for the Seas Surrounding Denmark" (Miljøministeriet, 1986). The plan was the Ministry's alternative to the 6-point-plan and an attempt to comply with public demand and restrain enthusiasm for governmental policies. The plan included more general aspects of pollution strategies and was more moderate in the time limits for implementation. The plan was met with scepticism and was regarded as vague.

On 12 November 1987, the Organisation for Conservation of Nature held another committee meeting, this time open to the public. At this meeting some modifications towards the earlier-published 6-point-plan were made. These were largely concerned with the time limits (extension of the implementation period). Demands to reduce nitrogen and phosphorous discharges were at the same time specified by 50% nitrogen reduction (total for all implied sectors) and 80% phosphorous reduction (total for all implied sectors), respectively. This was the first time, in this connection, that the demands for reduction were quantified. The measure of 50% reduction originated from a report from the Environmental Agency in which researchers from a Marine Pollution Laboratory had shown that present concentrations of nitrogen had doubled since the beginning of the 60s (Miljøstyrelsen, 1984a).

These specified demands (the reduction percentages as well as the time limits) were included in a resolution which was agreed upon 18 November 1986 in Parliament—5 weeks after the first news reporting the dead lobsters. The resolution was presented by one person in the party supporting the government, and was a result of close contact between this person and the Organisation for Conservation of Nature. Pressure was put upon the Government to make a plan before 1 February 1987 that would include strategies and investment specifications for reducing total nitrogen and phosphorous discharges and runoff from domestic and industrial sewage and agriculture by 50% and 80%, respectively.

The underlying principles in the Water Action Plan were set.

2.1.2 Formulation of a Solution

The resolution in Parliament forced the Government to work out a plan. A committee was formed which included members from the various ministries. This committee was to supervise and coordinate the execution of the work. The Ministries of the Environment and Agriculture were both represented in this committee. While assembling the demands, the Ministries argued about the resolution. The Ministry of the Environment favoured the resolution while the Ministry of Agriculture opposed. Each Ministry represented the underlying institutional interests. The conflicts of interest made coordination and supervisory functions very difficult. The supervisory functions were carried out by the Prime Minister and not the Minister of the Environment, as had been done traditionally. Basically, these internal governmental conflicts were a threat to the Government and its position. The fall of the Government itself, and the calling of an election could have been the result.

At the same time (the beginning of December), a group was formed by the Danish Environmental Agency consisting of experts from various institutions, ministries, and research councils. They were asked to make suggestions on how to realise the contents of the resolution. Usually, this is a process where experts, the public and Governmental officials, and representatives from major industries and trade unions seek compromises and solutions through negotiation. The Organisation for Conservation of Nature had no part in this group. Few meetings were held mainly as a result of the time constraints that gave the group only two weeks to present a suggestion. They managed to agree on two points: that the time limits outlined in the resolution were unrealistic, and that the nitrogen and phosphorous estimates from the NPO Review were, at that time, the best basis for legislation (even though they had reservations towards the scientific support for the estimates). Actual part solutions were also achieved. These were concerned with cleaning of the industry's contribution of nitrogen and phosphorous. The agricultural sector had reluctantly accepted a cessation of illegal discharges before 1 May 1987. Financial aspects of cleaning wastewater were also gone into.

Finalisation of the resolution and suggestions on how to realise the plan were made in the Committee formed by governmental representatives. Due to the internal Governmental conflicts, a large number of ideas and solutions were discussed, the end result being a proposal.

2.1.3 Resolution of the Water Action Plan

The proposal was put into motion in Parliament on 18 February 1987. Parties from the opposition were unsatisfied with all points within the proposal. A long debate resulted in the enactment of restrictions on the proposal. Reservations expressed by the group of experts towards figures in the NPO Review were disregarded, and the most optimistic and broad-ranged estimates were used in this proposal.

The final reading of the Water Action Plan was made by the Parliament's Environmental and Planning Committee. Traditionally, ordinary citizens, organisations, institutions, etc., can express their viewpoints in order to influence the final outcome. More than 20 organisations and institutions directed the committee. After 14 meetings a so-called Consensus Conference was held on 14 April 1987. It was organised by a Governmental council for research planning.

The purpose of this conference was to determine status and consensus on existing knowledge and to assess technical and economic conditions for improving the seas. Simultaneously, the conference gave the political parties the possibility to change side, which the governmental support party did. In this way, the parliamentary majority was secured.

On the 10th of June 1987 the Water Action Plan was passed in the Parliament. At the same time it imposed on the Government the formulating of a preliminary evaluation of the plan (goals and demands) in 1990. Finalisation of the Water Action Plan was made by one representative from two parties within the government (the party represented by the Minister of Environment was left out) together with the representative from the support party independently of the Environmental and Planning Council.

2.2 Contents of the Plan

The Water Action Plan consists of a large number of strategies and actions. Some of the main actions will be outlined in this section. It should be mentioned that the plan also includes strategies and reduction percentages for organic matter. However, these will not be commented on here.

The aim of the plan was to improve the quality of the surface waters surrounding Denmark: reductions in runoff and discharges from agriculture and from domestic and industrial sewage in Denmark to go into effect before 1993.

The basis values and intended reduction percentages for nitrogen and phosphorous discharges are outlined in Table 2.2, which also lists the estimated investments.

Table 2.2. Basis values for nitrogen and phosphorous discharges, reduction percentages (totals—compared to the current level) and estimated investments outlined in the Water Action Plan.

	Nitrogen tons/year	Reduction %	Phosphorous tons/year	Reduction %	Investment bill DKK
Agricultural runoff	260,000	49	4,400	91	4.5
Domestic discharge	25,000	60	7,200	72	6.0
Industrial discharge	5,000	60	3,400	82	1.5
Total	290,000	50	15,000	80	12.0

The plan includes more detailed descriptions of strategies for achieving the specified reductions. Some of the actions are: extension of existing wastewater treatment plants to comply with laws concerning concentrations of nitrogen and phosphorous in the cleaned wastewater, storage of farmyard manure in tanks, spreading of farmyard manure on the fields during only special times of the year, and keeping a certain percentage of the fields planted all year. Other strategies and actions can be seen in ATV (1990).

In general, the basis figures in the Water Action Plan are from the NPO Review from 1984 (Miljøstyrelsen, 1984b). The figures in Table 2.2 have been criticized

extensively (see section 2.3). Some comments on their origin will therefore be given.

The estimates of agricultural runoff and discharge have been discussed and commented upon since their publication in 1984 (Miljøstyrelsen, 1984b). The agricultural phosphorous load is assessed to be 4,400 tons phosphorous per year. This assessment has been made by experts from the Danish Environmental Protection Agency which was the institution publishing the NPO Review. The background for the assessment is single small-scale pilot experiments made on an area of well-nourished Danish ground.

The agricultural nitrogen load was estimated to total 260,000 tons per year, a result of assessing the runoff from the fields as 200,000 tons per year, and the discharges from the farm courts to 60,000 tons per year. The estimate of the field runoff is based on model calculations. The computer model used for this was based on the fundamental mass-balance assumption that input amounts of nitrogen coming into the field are in balance with the output amounts of nitrogen running off the field. Based on estimates in the NPO Review (Miljøstyrelsen, 1984b), the computer model calculated the runoff to be 160,000 tons per year. The rest, namely 40,000 tons per year represents a fraction of a non-explainable residue also resulting from the model calculations. These two values 160,000 and 40,000 tons per year were added to give a total estimate of the annual runoff of the fields to be 200,000 tons.

The model in itself is not well-documented in literature, and is mainly based on very simple calculations where input parameters are taken from literature studies or as results of small-scale experiments.

Values for industrial and domestic discharges are based on assessments and measurements made by representatives from industry and public wastewater treatment plants.

The reduction percentages are essentially political goals. No calculations or evaluations have been made on the effects of reducing discharges and runoff by the specified percentages. The estimated investments are fundamentally set by looking upon the technical necessities for reducing the discharges and runoff.

2.3 Raised Critique

The Water Action Plan has been called "the largest environmental investment in Danish history". An amount of 12 billion Danish kroner will be spent within 3 to 5 years.

The plan (strategies and actions) has been questioned from many sides and points of view. Most of its parts have been subject to a critique: the goals, scientific and technical knowledge, basis figures, formulation of a solution, and process of implementing the plan. In this section, some of the main points will be summarized. These can be related to a) the basis for the decisions, b) the decision process and c) the goals and implementation of the plan. These critiques have mostly been based on the evaluation of the plan made in 1990.

2.3.1 Critiques Associated with the Basis for the Decisions

Technical and scientific calculations have been criticized extensively, focusing on the model and model estimates of the agricultural nitrogen runoff. The model consists of a number of simplification, and assumptions which have been questioned by institutions, scientists, and farmers. Experiments and calculations made in Sweden indicate that mass-balances are insufficient for describing

chemical processes in the ground (Røjel, 1990); the complexity of describing nitrogen soil processes is high, especially as knowledge about them is limited. Furthermore, the results indicate that input quantities to the ground do not necessarily equal output quantities from the ground. Mass-balances obtained from the model will, in this case, not deviate from measurements made of the real world.

A validation of the utilised model has not been made. The estimated 260,000 tons of nitrogen per year from agricultural runoff is consequently criticized. The Water Action Plan accepts the value without reservations. The expert group and the NPO Review have expressed reservations towards the exact number. Due to these large uncertainties many people believe that preliminary results (which were to come in 1990) of the earlier initiated research programmes should have been delayed until more accurate data were available.

Scepticism has also been raised towards the institution which was the developer of the model. In an evaluation of the capability of Danish research institutions made in 1984 (Danish Council for Research Policy and Planning, 1984) this institution has been characterised as “being below Danish research standard”. That characterisation has raised additional questions about the basic values used in the plan, despite the fact that a characterisation of this kind can itself be questioned.

Very few socioeconomic evaluations of the plan have been made; individual assessments have been made of some of the strategies outlined in the plan (mainly concerning employment), but this was done only *after* the final resolution of the Water Action Plan. Economic changes on a national level have not been considered even though the expenditure of 12 billion Danish kroner would be expected to have an effect on financial balances.

The plan has been criticized for focusing on political goals—reduction percentages and time constraints, instead of the original goal—improvement of the water quality of Danish surface waters. As a result, the means to achieve improvements of the waters has become a goal itself. Discussions have, therefore, been concerned with figures (basis figures, reduction percentages, investments) instead of the waters. Definitions of the keyword “water quality” have not been made, nor has it been considered how to measure changes in the water, or to which extent changes and improvements should be carried out. Consequently, this means that reductions of nitrogen and phosphorous loads with the specified percentages have not been associated directly with the water quality. To what extent these reductions will bring decisive improvements of the seas has been questioned. Furthermore, the introduction of the 6-point-plan has, somehow, excluded considerations on alternative strategies—strategies as, for example, international restrictions which not were considered in the 6-point-plan.

2.3.2 Critiques Associated with the Decision-making Process

The Government and Parliament knew about the problems noted above and in 1985 made a plan for regulating them (the NPO Review – Miljøstyrelsen, 1984b). Furthermore, research programmes were already initiated and preliminary results were expected in 1990. Cognizant of the situation, many people and institutions (e.g. ATV, 1990) have questioned if this was the right time to make new regulations and were opposed to the speed with which the plan was made. No new results of the scientific and technical knowledge from research programmes had been published meaning that the basis knowledge contained within the Water Action Plan in 1986/87 was exactly the same as in 1984/85 where the NPO Review were made.

Due to the political situation many factors have influenced the decision-making

process: intensive covering in the media, interest organisations, industry, farmers and conflicts within Parliament. These conflicts were partly due to differences between two Governmental institutions, namely, Ministry of the Environment and the Ministry of Agriculture, and partly between political blocks, the Government and the opposition. Until the Consensus Conference, the opposition had the majority in Parliament in this question about the water quality, which (as already mentioned) could have brought down the Government.

All these factors have made the decision-making situation very unstable and uncertain. The instability probably made the politicians feel a certain pressure. Objections and comments on the uncertainty connected with the basic figures have therefore been overlooked.

2.3.3 Critiques Associated with the Goals and Implementation of the Plan

As a natural consequence of the other critiques, the contents of the Water Action Plan itself have also been criticized.

The effects of reducing Danish loads with the specified percentages have been questioned. A Danish institution (see ATV, 1990) has estimated that the Danish contribution to the load of nitrogen to the Kattegat is approximately 10% of the total. That means that 90% of the nitrogen input comes from neighbouring countries and atmospheric deposition from all over Europe. Thus, cutting the Danish contribution in half will probably have only a small effect on the water quality, and thus may not be sufficient. Many fear that additional investments will be necessary in a couple of years.

The debate has been focused on nitrogen compound discharges. In the Water Action Plan efforts have been put into regulation of nitrogen and phosphorous loads from three sectors: industry, public wastewater treatment plants, and agriculture. The effect of including industries has been questioned: only 20 Danish industries adhere to the restrictions. Before 1986/87 discharges from the public wastewater treatment plants were regulated in the Danish counties. Some counties had claims for the contents of nitrogen and phosphorous in cleaned wastewater which were much more strict than others in that some coastal areas are considered to be more sensitive. The demands in the Water Action Plan are national demands on loads in cleaned water. Some plants will, therefore, be allowed to increase their contents of nutrients in cleaned wastewater. Most restrictions are put on agriculture, despite uncertainties related to the role of nitrogen loads from farmers. Imposing additional demands on the agricultural sector (compared with the restrictions in the NPO Review) are also questioned.

The time constraints for implementing the plan have been regarded from many sides as unrealistic and far too short. Maintaining these time limits has, therefore, encouraged further critiques of the plan.

Some single actions in the plan have unfortunate side effects, for example, the demand of keeping a certain percentage of the fields green all year. This will probably result in the use of more fertilisers and pesticides. Regulation will in time be put into effect by imposing extra taxes on such products, which the farmers will no doubt regard as simply one more "penalty".

The plan is also criticized for focusing only on Danish loads to the waters. Air pollution (Danish as well as international) and loads (such as agricultural, domestic, and industrial discharges) from other regions in Europe are factors which also must be considered. However, in the Water Action Plan the intention is expressed to raise the questions internationally in order to force other countries to take similar action. But strategies on how or when to do this are not outlined.

2.4 Implementation of the Plan

Evaluation of the plan continued at another consensus conference held in January/February 1991 (see Undervisningsministeriet, 1991). Goals and strategies were to be judged in the light of preliminary results obtained on the monitoring programme (initiated simultaneously with the ratification of the plan). Unlike the previous conference held in April 1987, it took place in a strict scientific atmosphere; experts were well represented in both the panel to be questioned as well as the panel imposing the questions. Some main conclusions drawn were:

- Problems persisted regarding the pollution of water quality in groundwater, freshwater, fjords, and the sea. No improvements at sea could be measured.
- Enactment of the Water Action Plan will improve the Danish freshwaters and marine waters near the coast significantly with the passage of time.
- A general change of the plan was unnecessary. However, the need was expressed for locally differentiated demands.
- Improvements in the marine waters could be expected only if neighbouring countries implement similar reductions as well as reductions in air pollution.
- The time schedule in the plan should be extended; the extension and building of wastewater treatment plants must be carried out prior to 1995 rather than 1993.
- The agricultural sector is the primary polluter of the waters.
- Further reductions of pollution levels were necessary, and economic instruments (as, for example, a tax on fertilisers) should be applied in the agricultural sector in *parallel* with similar actions in other European countries.

A few comments on the second consensus conference should be given. The conference focused mainly on establishing a scientific consensus on matters discussed extensively since 1987. The conference could be seen as an event in which the scientific consensus should be established once and for all, and through this provide a basis for justifying the political decisions. Seen from a critical viewpoint the conference at the same time recognised in public that the politicians had lost some credibility in the ratification process leading to the Water Action Plan. In stead of emphasizing current and past problems, a conference such as this one ought to have been used to find prospects for further strategies. However, this could not be done before the strategies already implemented were evaluated.

2.5 Summary

The Danish Water Action Plan became a reality in 1987 after a hectic 5-week debate had taken place in the whole society. For years, problems concerning the Danish marine waters, as for example fishdeath, had been investigated and discussed. The debate was taken up again in the media when the Danish television news programme showed pictures of dead lobsters caught in the Kattegat. The debate that was raised in the media was followed up by a non-governmental organisation for the protection of nature. This organisation specified six simple goals and overall actions to attain them for improving the quality of the Danish waters quickly. The political forum at the time was taken by surprise and was forced to adopt the goals of the six-point-plan and ratify the Water Action Plan.

The plan was ratified after 6 months of debate and the implementation then was put into effect. The implementation of the plan is seen as the largest environmental investment ever made in Denmark.

During and after the ratification process, the plan and how it was developed had been criticized heavily by almost all groups of society. There were many points in the decision-making process that were handled internationally rather than through logical procedures. The lack of structure in the process almost led to the fall of the Danish government.

3 The Dutch National Environmental Policy Plan

Environmental plans emerge all over the world. In the Netherlands, a so-called integrated¹ national environmental policy plan was agreed upon in June 1990. The plan was unique in its innovative approach on developing a single overall comprehensive plan to comply with all of the country's environmental problems. Under the ratification of this plan, the Dutch government fell, as a direct result of the complexities facing national planning. However, the plan itself was formulated and structured in a flexible way giving options for changes and modifications of the strategies in future time points.

The plan has been studied with great interest by many other countries (Belgium, France, United Kingdom), and ideas from this Dutch experience have influenced other European policies. Most noteworthy is perhaps the Integrated Action Plan, which the European Community (EC) wishes to develop (referred to as the Community's 5th Action Programme on the Environment—preliminary calculations and background reports are already available—see, for example, RIVM, 1992). This EC initiative will be strongly influenced by the Dutch environmental policy plan, perhaps proclaiming the Netherlands to be the number one European country in environmental management.

The Dutch plan will be outlined here and presented as another example of environmental planning and decision making. The following description is based on Bennett (1991), NEPP (1989), and Langeweg (1989).

3.1 The Decision-making Process

The rapidly growing number of environmental problems raised in the Netherlands during the 80s has made administration increasingly difficult through the existing system of sectoral separation of pollution-control measures. These obstacles for policy making initiated the idea of developing an integrated environmental plan—an idea that was underway since the beginning of the 1970s.

In 1981, the Minister of Environment released ideas of adopting a more radical approach to environmental problem solving. At the same time the newly formed government responded to an international report on world conservation strategy. This created the ideal forum to enable the government to show initiative and take "the lead" in these issues. Shortly after, the Cabinet announced that an integrated environmental policy plan would be drawn up. This started the actual decision-making process for formulating the National Environmental Policy Plan. An overview of important dates and events of this process can be seen in Table 3.1.

The plan was prepared by an interdepartmental group and presented in Parliament in 1983. In this plan ideas were outlined on how the integrated system of environmental policy should be structured and managed. The proposals received broad political support and were elaborated further by the Minister of the Environment in the following year. This paper did set the framework for the present system of environmental planning in the Netherlands.

1. The term integrated means here that the plan comprises actions to be taken in more than one sector and deals with all larger environmental problems in the Netherlands at the same time.

Table 3.1. Important dates and events in the decision-making process for the Dutch National Environmental Policy Plan.

Dates	Events
1981	Minister of Environment expressed ideas of a needed change of the public environmental planning system Response on the report on "World Conservation Strategy" released from newly formed government Incentives for developing an integrated policy plan were announced by the Cabinet
1983	A preliminary plan presented in Parliament
1987	First deadline for the National Environmental Policy Plan
1988	The National Institute for Public Health and Environmental Protection (RIVM) released the report "Concern for Tomorrow"
April 1988	Negotiations on the National Environmental Policy Plan were stopped. Most points agreed on
May 1988	Intragovernmental opponents to the plan Fall of the Government
September 1988	Publication of a preliminary version of the National Environmental Policy Plan A new coalition government was formed Tightening of points in the plan. Formation of NEPP Plus
June 1990	Final resolution of NEPP Plus

The actual National Environmental Policy Plan was to be published in 1987, but due to the scope of the plan this deadline was pushed back first to spring 1988, then simply during 1988, and finally to spring 1989. These delays were indicative of fundamental problems in elaborating such a plan, requiring support from several departments such as the Ministry of Environment, Ministry of Transportation, Ministry of Agriculture, and Ministry of Economic Affairs. Other problems were getting measures and information to form the basis for the plan, and agreeing on the points in the plan (agreement was sought between all interested parties that would be affected by the specific measures).

In 1988, the situation tightened. First, opinion polls showed that the Dutch considered environmental protection to be the most important issue in society. And second, the National Institute for Public Health and Environmental Protection (RIVM) released a report "Concern for Tomorrow" (Langeweg, 1989). The report was made within one year on request from the Minister of Environment. It was a result of a multidisciplinary cooperative study between most scientific institutions in the Netherlands, attempting to provide insight into the Dutch environmental problems by generating scenarios with short- and medium-term perspectives. The conclusion was that large reductions in various emissions were necessary if the impacts of the problems should be consistent with the concept of sustainable

development². It followed from this that much money had to be spent in add-on technologies, rebuilding plants, etc.

The fact that RIVM was the institution behind the report created an enormous public debate which was begun by non-environmental groups in Government. This reaction was brought about by RIVM's reputation as the most prestigious environmental research institute in the Netherlands, enjoying high international respect as well.

Almost instantly conflicts among the various ministries were raised as well as within their departments. Those within the Ministry of Environment concentrated on the costs for improving the environment, with questions such as who should pay for the improvements, and what proportion should be paid by consumers, polluters, and the state. The upcoming elections in 1990 put a preliminary cease fire on these conflicts and by April 1988 most points were agreed upon.

So it seemed. But later that month it became obvious that some parts in the plan not were based on agreement. One point in the plan implied that the cost of driving motor vehicles would increase. Over a long period of time the Minister of Finance had expressed his concern about the high costs of implementing the National plan, and questioned some rather vague arguments that were given on how some of the measures if the plan could be financed. Suddenly other people in Parliament (also members of the coalition government) supported the Minister of Finance, and on May 2nd, the text of the plan was moved from the Parliament's upper chamber to its lower chamber by the opponents of the plan, who threatened to withdraw their support unless points concerning taxes on private cars and increasing duty on gasoline and diesel fuel were withdrawn.

The Prime Minister was not prepared to agree to this and as a result of pressure from the coalition party of the Government, he resigned. Naturally, the fall of the Government was a result of more long-lasting intragovernmental conflicts that culminated.

On 25 May 1989, the National Environmental Policy Plan was published in the form in which it was agreed upon by the Cabinet. The formal debate and resolution had to wait until after the election set in September of that year. Surprisingly the election did not result in changes in the plan to any great extent. Only a few points were tightened, for example, the time allowed for reducing carbon dioxide emissions was shortened. Furthermore, several amendments had to be made to the plan, such as those that expressed the new coalition Government's point of view and fulfilled promises made in the period up to the election. The plan was then called the National Environmental Policy Plan Plus (NEPP Plus). In the following chapters, the plan will however be referred to only as the National Environmental Policy Plan (NEPP).

The next seven months were characterised by discussions and a degree of reluctance from, among others, target groups that were supposed to bear the economic burden of implementing the measures of the plan, as well as environmental groups that feared that there might be a substantial delay in putting the NEPP Plus into effect.

Finally, the NEPP Plus was ratified in June 1990.

3.2 Contents of NEPP

The Dutch National Environmental Policy Plan sets out about 50 strategic objectives, and 228 specific measures. It is not intended that they be commented

2. The concept of sustainable development shall be understood broadly as defined in the UN (1987) report

upon here. They can, however, be found in NEPP (1989).

The principal aim of NEPP Plus is to solve the country's environmental problems within a single generation (operationally 20-25 years). The central precept for achieving this goal is sustainable development. Some of the plan's most important objectives and measures are outlined in Figure 3.1 (from Bennett, 1991).

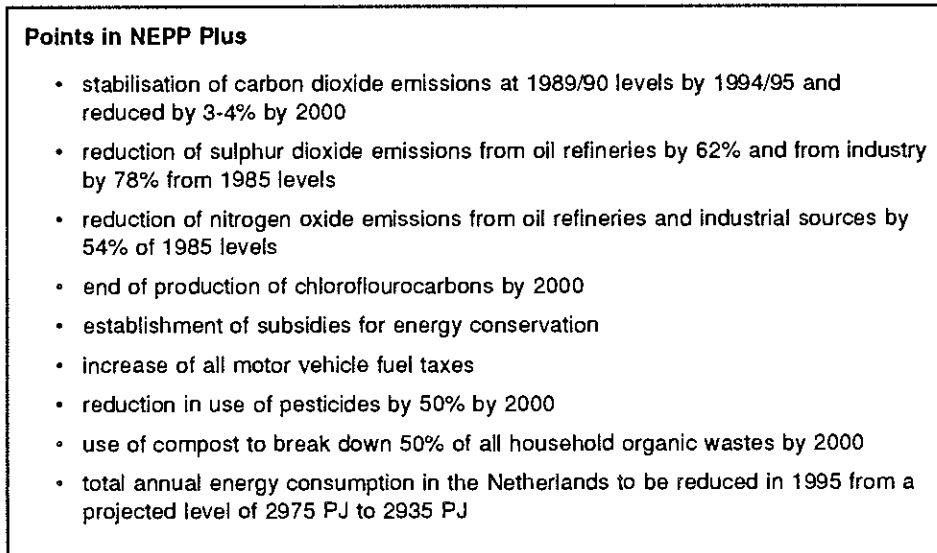


Figure 3.1. Single points in the NEPP Plus (source: Bennett, 1991).

The specific control measures focused on 6 areas, namely, climate change, acid rain, disposal of hazardous substances, management of wastes, "nuisance" pollution, and potential reuse of materials.

Furthermore, estimated costs for implementing these measures (until 1994) are given.

The measures were directed at seven target groups: agriculture, transportation, industry, the energy sector, the construction sector, environmental management companies and utilities, and consumers.

The strategy within the plan, and the origin of the basis information will be commented on below.

The basic idea in developing the plan was to draw up periodic national and provincial environmental plans to integrate government policies. Four distinct plans draw up the integrated approach as illustrated in Figure 3.2.

Structure of the integrated approach

- a strategic national plan in which the main lines of the environmental policy over a 10-year period shall be set out
- a longer term plan covering up to 30 years within which the national plan should be established
- operational successive plans focusing on implementation of the broad policies covering a period of 4 years and with annual revisions
- corresponding strategic and operational plans drawn up by regional and local authorities

Figure 3.2. Points in NEPP's integrated approach (source: Bennett, 1991).

The key element is the national strategic plan which is based on eight concepts:

- a. a standstill principle to ensure environmental quality does not degrade any further
- b. pollution abatement at the source
- c. the "polluter pays" principle
- d. prevention of unnecessary pollution
- e. application of the best practicable means of pollution abatement
- f. application of the principles for isolating, controlling and monitoring wastes
- g. source-oriented controls based on effect-oriented quality standards
- h. internalisation of environmental control into activities of the target groups (that will bear the economic burden)

The principles were given form through integrated life-cycle management; energy conservation, and improvements in the production processes and in the quality of products, raw materials, and the environment to ensure that the use of raw materials is extended.

"Concern for Tomorrow" (Langeweg, 1989) has been the background document for NEPP Plus. The problems have been described at 5 spatial scales: global, continental, fluvial, regional, and local scale. Problems have been handled by focusing on timely perspectives for damaging effects and for recovery of the sensitive ecosystems.

In the generation of prognoses and scenarios, mathematical models have been used and have played a central role (Olsthoorn, *et al.*, 1989). Since no single model can provide the necessary overview of all these problem areas, several compartment and Integrated Models (the concept of Integrated Models is defined in Sørensen, 1993a, Annex 1) have been coupled and used. A schematic overview of the models used and linked can be seen in Figure 3.3.

Because of the time schedule on the calculations (one year), the models were based on existing knowledge and data. Future estimates were mainly based on extrapolations of past trends. Deviations from these trends will be considered in the future evaluations of the plan.

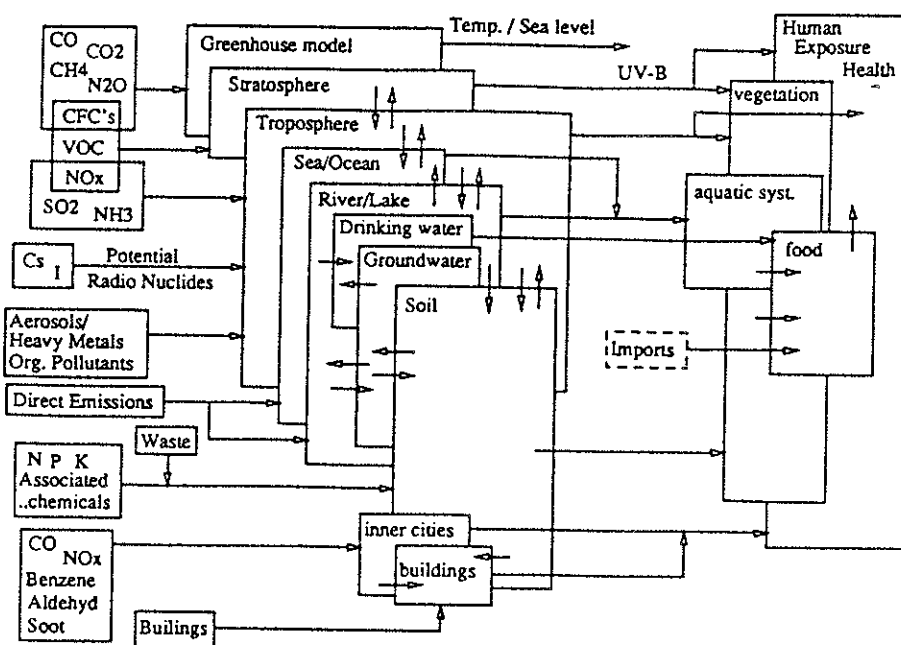


Figure 3.3. Overview of models used and linked for providing information for the Dutch National Environmental Policy Plan (from Olsthoorn *et al.*, 1989).

The models have been run through a more or less manual process where data from one model have been fed into another, and based on this several scenarios have been created. In the documentation on the modelling work (see, for example, again Olsthoorn *et al.*, 1989), the limitations in the process, as, for example, the necessary cooperation between various institutions, was expressed and recognised.

The fact that these models were based on a broad scale (in opposition to detailed models), they were mainly used for screening the problems. Additionally, it is the intent to evaluate these models continually and use more detailed models in future evaluations of the plan itself. These evaluations shall be carried out every two years, based on the new available information.

The measures, scenarios, etc., are extensively covered in the Langeweg (1989) report. However, not much attention has been put into uncertainty analyses of the results. Concern about these matters is expressed in this report as it is intended to include such aspects in future work.

3.3 Implementation of NEPP

It is still too early to judge the effects of NEPP (Plus), since it came into effect only in 1991. However, it is already obvious that the measures to be taken from 1991 to 1994 generally fall below the interim objectives necessary to meet the goal (Bennett, 1991). This means that the government probably must adopt stricter measures after 1994.

Also deadlines for implementing the measures contained in the plan are falling behind schedule. One major reason for this is that the measures not are sufficiently oriented towards implementation. The limited capacity of various environmental policy-making and pollution-control authorities to implement the large number of measures is one problem. Another, is the time it takes for

industry and other target groups to respond to the new demands.

Criticism of NEPP (Plus) has been focused on these points. Additionally, the plan has been criticized for being too ambitious compared with actions taken in other European countries. It is feared that the large economic burdens imposed on industry and agriculture in time will become a threat to the Dutch economy.

The second NEPP must be made in 1994 and will set out measures to be taken in 1995 to 1998.

3.4 Summary

In many ways the Netherlands must be characterised as the leading country worldwide in regulating environmentally damaging issues. However, the Netherlands also became the leading country concerned with effects on policy making caused by environmental issues.

In 1988, the Dutch government fell as a direct result of governmental conflicts arising from the resolution of the Dutch National Environmental Policy Plan.

In the beginning of the 80s, concern was expressed about a large number of future and present environmental problems that would have to be regulated in the Netherlands. It was decided to develop an integrated environmental plan that could take into consideration most of the problems of the Netherlands.

RIVM was given the job of providing the scientific support to the policy negotiations and decisions. Most scientific calculations were achieved by linking together several mathematical models and data (Integrated Models). RIVM's role was of major importance since no concern was ever expressed or doubt about the scientific knowledge and basis for the plan.

The Dutch National Environmental Policy Plan was highly based on the RIVM study, and a plan was formulated giving scope for future modifications of objectives, and regulations by including a number of smaller timely periods ending with follow ups running over a long-term period in total.

In the public the plan was taken seriously. The problems were to be found in the Government itself. Some of the officials in the Government had their doubts about the financial and timely perspectives of implementing the plan. The conflicts resulted in the forced resignation of the Government, and the new Government modified the plan before it finally was ratified.

The plan is still relatively new, so it is in fact too early to judge its effects. However, some criticism of the plan has been raised concentrating on the non-realistic time schedules for its implementation, and on the economic burden the plan imposes compared to the other countries of the European Community.

In spite of the difficulties with the plan, it is a comprehensive and unique work that is an inspiration for similar endeavours in other European countries.

4 Comparing Elements of Uncertainty

The two plans described in Chapters 2 and 3 have many similar points. Both plans were outcomes of complex and highly conflict-filled decision processes. Table 4.1 summarizes the aims of the plans and special points to characterise the plans and their development.

Table 4.1. Aims and special points to characterise the plans, the Danish Water Action Plan and the Dutch National Environmental Policy Plan, and their development.

The Danish Water Action Plan	The Dutch National Environmental Policy Plan
<p>Aim: to improve the quality of Danish surface waters by reductions in runoff, and discharges from agriculture, and domestic, and industrial sewage to be made before 1993</p>	<p>Aim: to solve the Netherlands' environmental problems within one generation—operational goals is to make environmental problems manageable within 20 – 25 years using the central precept of sustainable development</p>
<p>Special characteristics:</p> <ul style="list-style-type: none"> • elaboration and ratification of plan within 5 weeks • largest Danish economic environmental investment made • media-ruled decision process • political pressure in Government, Parliament, and outside Parliament 	<p>Special characteristics:</p> <ul style="list-style-type: none"> • elaboration of strategic and specific measures and estimated costs • integrated approach • operates with short-, medium-, and long-term goals and strategies to deal with uncertainty • political pressure in Government—fall of Government

If the political confusion is disregarded for a moment, seen from a methodological angle, the two plans were developed using different strategies. The Danish Water Action Plan can be seen as a result of many simultaneous events all in some way influencing the decision-making process. The development of the plan did not follow any specific strategy or methodological approach. This was not the case with the National Environmental Policy Plan. Again disregarding the political confusion, the development of the plan followed certain principles that in many respects limited the uncertainties of, for example, the scientific knowledge in a sound way. The criticism leveled at the Danish Water Action Plan was enormous while the National Environmental Policy Plan was exposed to criticism which must be considered always to follow political decisions. It is the intent of this chapter to identify the various elements of uncertainty that were at least contributing factors if not the cause itself of the different outcomes of the plans.

4.1 Elements of Uncertainty

Before specifying the uncertainty elements in the plans, it is necessary to be specific on some of the terms to be used. The general concept of “uncertainty” is used about situations where fundamental knowledge is insufficient or incomplete (see, for example, Fiddle, 1980). Uncertainties exist in many everyday situations, can vary in degree and be a function of the level of knowledge present. As a result, uncertainty can affect various situations differently. Where a large amount of uncertainty exists, the outcome of a decision applied to a situation cannot be predicted for the decisions or situation will be influenced by more or less random factors. It should be mentioned that “uncertainty” is used differently in different contexts and by different people. In the following, its use is confined to elements in which there is incomplete knowledge; a quantity cannot be determined precisely, nor can the outcome of a decision be predicted precisely. This discussion about the concept of uncertainty is further elaborated on in Sørensen (1993a).

Studying the two plans in more detail and the criticism raised, three different *types of uncertainty* can be identified all connected to the ratification processes of the plans and how they were formulated (Friend and Hickling (1987) also operate with different types of uncertainty defined in a similar way).

- **Technical uncertainty** is lack of knowledge that can be attributed to the formal description and analysis of a problem or a system, e.g. forecasting estimates, making estimates of current and historic measures, or the mathematical approach used for the calculations (for example, a mathematical model). The technical uncertainty is closely related to the quantities or measures and the method used to obtain them.
- **Structural uncertainty** can be attributed to the assumptions concerning the system related to the problem. This means how the problem is structured, i.e., how operational the problem has been defined, the scope of the problem, meaning the boundaries for the problem description, the aggregation level (level of detail in focus, and timely and spatial perspectives), as well as how the problem has been approached in solving it (methodological terms).
- **Sociopolitical uncertainty** is of a somewhat other character. This type of uncertainty is less quantifiable than the two previously mentioned uncertainty types. Sociopolitical uncertainty can arise as a consequence of the environment in which the decisions are made. This can be a consequence of the number of decision makers, conflicts of interests among various groups and/or persons, different perceptions in objectives and priorities of actions; but factors as timely pressure, and perception of scientific information can also lead to sociopolitical uncertainty that may influence the outcome of a decision-making process.

A factor such as the forecast, problem description, or timely pressure is referred to as an *uncertainty element*; it may contribute to the uncertainty and therefore to an unpredictable, non-objective, or biased decision or outcome.

Uncertainty types and uncertainty elements are discussed in more detail in Sørensen (1993a).

If we focus on the processes resulting in the Water Action Plan and the NEPP, several uncertainty elements can be found for the various types of uncertainty. Some of these are outlined in Table 4.2.

Table 4.2. Identified uncertainty elements in the Water Action Plan and the National Environmental Policy Plan.

Type of Uncertainty	Uncertainty Element	
	The Water Action Plan	The National Policy Plan
Technical Uncertainty	<ul style="list-style-type: none"> • large uncertainties in model results • no forecasts available 	<ul style="list-style-type: none"> • uncertainty in measures and forecasts (model calculations)
Structural Uncertainty	<ul style="list-style-type: none"> • lack of clear objectives/goals • lack of problem formulation • lack of basis knowledge, causes, effects, and relationships 	<ul style="list-style-type: none"> • many objectives and definitions not specifically oriented towards implementation • broad problem view • long timely perspectives • lack of basic knowledge, causes effects, and relationships
Sociopolitical Uncertainty	<ul style="list-style-type: none"> • time pressure • decision-making process ruled by outside factors • large conflicts of interests • more than one decision-maker • presentation of problem by the media • problem in realizing model uncertainty • presentation of plan for the public 	<ul style="list-style-type: none"> • time pressure • more than one decision-maker • conflicts of interests • enormous number of goals and measures for different groups to respond • presentation of plan for the public

The total number of uncertainty elements that did arise or could have led to uncertainty in the development of the two plans are almost equal. However, there was a difference in the way these uncertainties were recognised and managed.

4.1.1 The Technical Uncertainties

In the major critique raised in connection with ratification of the *Water Action Plan*, the technical uncertainties were disregarded almost entirely. In the decision-making process, the reservations expressed concerning the model calculations were completely disregarded, and the results of the model calculations were

viewed simply as facts of knowledge. Questions concerning the calculations were first expressed again at a much later stage *after* the ratification of the plan.

Since the model calculations raised much uncertainty one should think that the unavailability of forecasts for various measures would be beneficial. This was not the case, however. The lack of forecasts complicated the decisions since there were no figures to support them. Perhaps this element was contributed to the initiation of the monitoring programme and the followup on the plan in 1991 (the second consensus conference).

The technical uncertainties identified in *NEPP* were handled differently. The technical uncertainties were dealt with in two respects. First, RIVM was appointed to perform the scientific survey and produce measures that could be used as a basis for policy making. Choosing the Netherlands institution RIVM to lead the survey, gather data, and knowledge from other institutions did set the credibility of this work high. RIVM, as noted earlier, is considered to be a very well reputed institution in both the Netherlands and throughout Europe, known for its thorough work performed by both Dutch as well as international scientists.

Second, the uncertainty considering the specific estimates and prognoses was handled by calculating three different scenarios each representing different views on future economic developments. With these a comprehensive documentation behind the calculations was also published, addressing the uncertainties which were not dealt with explicitly (see *NEPP*, 1989).

Third, the concept of uncertainty was addressed often in both the RIVM report (Langeweg, 1989) and the *NEPP* report (*NEPP*, 1989) documenting the *NEPP*. This did draw attention to the existence of uncertainty and told how some of these uncertainty points were handled. The open discussion gives a certain credibility to for example the calculations. All in all, it is the author's perception that the technical uncertainties did not seriously influence the ratification process.

4.1.2 The Structural Uncertainties

As a followup of the major critique of the *Water Action Plan*, the structural uncertainty elements were shown to influence the decision-making process. The problem formulation and lack of manageable objectives in response to the pictures of the dead lobsters and the public request on action were compensated for by adapting the figures and goals of the 6-point-plan. This shifted the initiative to the public and non-governmental organisations instead of the Government itself. This was by many taken as a sign of Government weakness and raised some uncertainty not only about the results of the plan but also about the political situation.

The lack of scientific knowledge about cause-effect relations was disregarded by responding to the request on immediate action. The decisions had therefore to be based on the present state of knowledge. Only at a late stage concern was expressed about the state of knowledge, and only *after* the ratification process scientific programmes were established. Again the lack of knowledge raised uncertainty about both the political process as such as well as a scientific context that seemed vague and non-credible, filled with contradictory statements about causes, effects, and measures. Naturally, the establishment of the programmes following the ratification can be seen as a recognition that scientific support (and a certain level of consensus) is necessary in the policy discussions, and that such support must be available in future discussions.

RIVM also played a central role in managing the structural uncertainties of *the NEPP*. In their report (Langeweg, 1989) the institute had operationalized the concept of sustainability for the Netherlands by dividing the overall problem into

a natural number of subproblems that could be analysed and considered in terms of individual targets. By dividing the overall problem into smaller problem areas, the goals of the plan became more manageable and prevented the broad problem view from raising any unnecessary uncertainties about the plan.

Both the long-term perspectives of the actions to be taken as well as the lack of more specific scientific knowledge were handled by defining different time schedules for revising the plan as well as initiating scientific surveys to be carried out regularly. By doing this, the uncertainties introduced by the lack of knowledge and the long time perspectives were recognised officially, and can be handled when regularly evaluating the plan and its goals. In this way the NEPP as it is originally formulated becomes more of a starting framework to be modified and changed according to the changes of the environment and society. The plan becomes more flexible than traditional plans in the way that it can be modified significantly with time.

As the plan is implemented at present, it becomes more evident that the implementation time for the strategies are unrealistic. This is a point that is not dealt with directly in the plan, and consequently this leads to some criticism and raises uncertainties about the effects of the plan. Only time can tell how the Dutch will handle these perspectives. Possibly the options for modifying the plan at the intermediate time targets may serve as a means for putting into effect a general modification of the plan so that it would become more realistic in the implementation phase.

4.1.3 The Sociopolitical Uncertainties

For both plans the elements of sociopolitical uncertainty must be said to have influenced the ratification processes to the greatest extent. Some of the elements are naturally always present when political decisions are to be made, e.g., the presence of more than one decision maker, or of conflicting interests will probably be present, as well as the process of presenting the plan for the public and a certain time pressure. But again, at least some of these elements were handled differently in the two processes.

In the ratification process of *the Water Action Plan* all of the sociopolitical uncertainty elements played a central role. Of these, the focus in the process should be on the role of the media, the inflexibility of the plan, and the time pressure.

The presentation of the problem in visual terms by the television and the followup by the remaining media set the frames for a decision-making process highly influenced by outside Parliament factors. This is an unusual situation and raised uncertainties about the promises and actions that were expressed. The media-ruled process gave several institutions, organisations, industry, etc., equal right to express their opinions and opponents to present strategies for taking action. This led to an unusually high number of groups and persons who were interested in influencing the formulation of the plan, but it also raised large conflicts of interests. The media's interest in the process created a feeling of urgency that put time pressure on the process.

Concerning this time pressure, it must be said that nothing was actively done to diminish it. It was an urgency created by the public demand expressed more or less throughout the media. The urgency created a certain level of confusion and made some politicians react in an untraditional way (e.g., promising *immediate action*). A few attempts were made to restrain this pressure (publishing ministerial reports) but in a non-successive way.

Also, the problem of recognising or disregarding the uncertainties of the model

calculations (as mentioned under the technical uncertainty elements) created sociopolitical uncertainty. The fact that reservations towards the calculated results were expressed but ignored by the politicians subsequently raised questions about the authority of the politicians. This uncertainty is closely associated with the politicians' ability to understand scientific material and to accept that this is influenced by a certain level of uncertainty. Upon this the politicians' reputation was questioned concerning the ability to select the institutions that are able to provide the information that can be given a certain credibility and respect.

All in all the sociopolitical uncertainty elements contributed greatly to the unstable situation that almost resulted in the fall of the government.

The sociopolitical uncertainty elements were also present in the *NEPP* ratification process but with the managing of many of the other previously mentioned uncertainty elements, these sociopolitical elements did not come to play as large a role in the Netherlands as they did in Denmark.

It was not the large number of measures and goals in the plan that raised uncertainty but one or two political strategies and the figures related to the costs of implementing them. These were figures that not could be provided by the scientific context but had to be assessed in more overall perspectives. This created conflicts among the different decision makers that were in juxtaposition with the prestige involved in making the plan and having it ratified as rapidly as possible. The fall of the Netherlands Government just prior to the ratification of *NEPP* indicates two things, that environmental plans of this comprehensive character involve most groups of society and that there is a major focus on the achievements both within the country as well as outside. It shows that environmental policymaking has the strength and importance in society as other social issues handled by the politicians. That the Dutch government fell on the issue can also be more or less the coinciding of several events at the same time.

At an early stage information was presented to the public in an understandable form (the Langeweg, 1989, report). This was the basis for the arguments and objectives used at further stages in the process, and consequently appealed to the community as a whole for the ideas. The presentation probably gave the government the lead in these questions thus preventing major opposition.

4.2 Summary

This chapter compares the Danish Water Action Plan and the Dutch National Environmental Policy Plan in respect to the uncertainties present in the ratification processes and how these were handled.

Three types of uncertainty were identified in the processes, namely, technical uncertainty associated with the technical and scientific measures of the environmental systems, structural uncertainty associated with the way the environmental problems were expressed and approached in solving them, and finally the sociopolitical uncertainty that can arise as a consequence of human activities and conflicts. The existence of uncertainty gives a certain unpredictable and random effect on decisions and their outcome.

For both plans several uncertainty elements (factors that can give rise to the uncertainty) could be found. However the uncertainty elements were clearly handled differently in the two processes. Almost no concern was given to the uncertainty in the ratification process for the Water Action Plan. Therefore the plan can be looked at as a result of more or less random events. The *NEPP* was clearly a result of a more documented and structured approach where many uncertainties were handled through appointing a strong institute to provide the necessary scientific information, and by being open about uncertainties by

dividing the plan into sub-plans to be modified and changed with two year intervals in accordance to the level of scientific and social knowledge. That the government fell in the process must be said to be a result of the large level of prestige with such environmental plans, and perhaps a result of random events that seldom can be managed in advance.

5 Methodological Aspects of Planning

It is difficult to judge the relative contribution of each uncertainty element to the uncertainty of the whole ratification processes. The uncertainty elements cannot be compared in a quantitative way, and it appears that some uncertainty elements arise as a result of the existence of other elements of uncertainty. One example is the time pressure of the Danish Water Action Plan. This created uncertainty because of a) the media's role, b) scientific information and doubts regarding it, and c) internal and external governmental human conflicts to mention a few.

In the ratificational process of the Dutch National Environmental Policy Plan, most structural and technical uncertainty elements were handled and it is the perception of the author that the sociopolitical elements of uncertainty were the primary causes of the fall of the government.

Studying the two processes and plans in terms of uncertainty elements, it seems as if sociopolitical uncertainty elements are the most difficult to overcome and control. Additionally, the study of the NEPP indicates that the technical and structural uncertainty elements can be managed to a certain extent, and through this the sociopolitical uncertainty is diminished as well.

It is the aim of this chapter to suggest a methodological framework for performing environmental planning. It is a framework that shall be seen as a flexible "scaffolding" which can be extended or otherwise modified in order to follow the dynamics of the specific problem which is sought solved. It attempts at handling uncertainty elements through structuring the environmental planning and decision-making process. However, not all uncertainty elements will be dealt with through this approach and specific concern must be put into these (see later for references).

Ideas for the approach are based on Sørensen and Vidal (1991), Etzioni (1967), and principles of the so-called soft systems thinking as can be seen in, for example, Rosenhead (1989).

5.1 A Framework for Environmental Planning

As a result of the work with the two plans, the framework considers three aspects to be of fundamental concern when performing environmental problem solving. These aspects are:

- *Time.* The use of time must be limited in many of the aspects of the plan. First of all, the time period must be limited for developing the plan, that is, the process from raising the problem to establishing the scientific knowledge and translating this process into operational actions. This means that there usually is insufficient time for establishing complete scientific knowledge and this has to be accepted by all involved parties. Furthermore, a realistic estimate must be made of the time it takes to implement the actions of the plan. This point has been disregarded in both plans and is a point where they have received a lot of criticism. As outlined in both plans it is also necessary to give special consideration to the time perspectives of reaching the goal of each plan and be able to evaluate and modify it at intermediate time intervals.
- *Flexibility.* As already outlined with the time frames, it is of major importance that the plan can be evaluated and changed when knowledge of the problems changes or the dynamics of the environment or society change

through the implementation period. This means in principle that the plan that shall be formulated and ratified only in preliminary form, but with future strategies that can be decided on at future intermediate time intervals.

- *Information.* Lastly, the issue of information is seen to be of major importance. There are three aspects of this: a) scientific information to inform decision makers and planners, b) political information to inform the scientists of the need for and type of information sought, and c) information to the public—of both a political and scientific nature. Traditionally, the problem-solving process is a compartmentalized one where the scientists do their work and decision makers, in theory, make decisions based on the scientific knowledge available. This is naturally not completely the case in real life—the "borders" are less visible, but do however exist. Focusing on the plans, it is clear that the scientific context had a major influence on policy making. Therefore, it is important that the scientists clearly report their findings and the assumptions behind them. On the other hand, they are unable to provide sufficient information unless the decision makers are clear on what kind of information they need. The information exchange must therefore go both ways. In regard to the public role in the communities, general information must be given at an early stage. This is a necessary step to acknowledge that the public has influence on these processes, and also to give the public a chance to express its opinions through controlled channels. Public information is a kind of education process for society as a whole, which is necessary if large actions to be taken shall find consensus.

These aspects are built into the methodological framework to follow. The schematic outline of the framework can be seen in Figure 5.1.

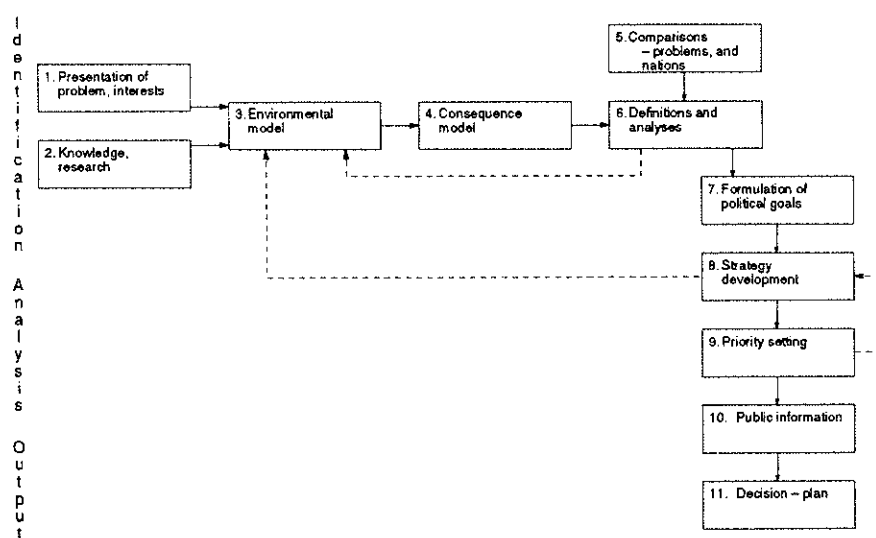


Figure 5.1. Schematic presentation of the methodological framework for environmental problem solving (ideas are based on Rosenhead, 1989).

The framework is assumed to represent the structure of a problem-solving process. The stages of the traditional problem-solving process (see, for example, Guariso and Werthner, 1989) is here assumed to be non-distinguishable and interchanged so more focus is on identifying and analysing the problem and its solutions through cooperation.

The *identification phase* will be the most demanding phase, one concerning time, work, and level of cooperation. As was seen with the Water Action Plan, the environmental problems are usually not recognised beforehand. The problem is usually first recognised by the decision makers when it is presented in the media by researchers, journalists, or representatives of non-governmental interest organisations (box no 1—the box numbers in the following text refer to the numbers of the boxes in Figure 5.1). The manner of presentation of the problem can influence the decision-making process severely as seen with the Danish Water Action Plans with the presentation of the dead lobsters and the followup in the media. Therefore, it is suggested that after a serious problem has been presented and it is decided to take action, a group of experts representing various scientific disciplines and interests on both the technical, natural as social sciences, as well as representatives of planners, and special interest organisations are brought together. It is assumed that the interests of various groups in the public are also represented. Consequently, interests (box no. 1) and knowledge and research (box no. 2) are gathered and expected to form the basis of outlining strategies and actions for the plan. Through cooperation, discussions, and analyses the groups shall be able to define the problem in operational terms and the system surrounding the problem area. They shall also define how effects and improvements possibly can be measured, and they shall outline a number of different strategies and alternatives, both to be decided upon now but also to be future components of the plan. The main aim of this group is to obtain as many views on the problem as possible.

It is evident that the description of current and future problems can be very complicated and demanding in terms of time. Computer models describing both the environmental systems (box no. 3) as the associated socioeconomic consequences of different actions (box no. 4) could be helpful tools to gather information in a structured way and get an overview. Both the decision-making processes of the Water Action Plan as the NEPP were supported by computer calculations. By use of the models, an integrated description of the problem can be outlined and effects of various control and regulatory strategies can be analysed. Naturally, development of computer models is a time-consuming process completely out of proportion with the time frames for establishing the first plan. It shall be discussed whether already existing models can be used for the support of the initial decisions, and whether establishing new computer developing programmes shall be put into effect for future use. In any case it is of crucial importance that the models and their results be used critically. This means that the models must be evaluated with regard to assumptions behind the calculations, uncertainties of the calculations, the limitations of the model as well as the overall credibility of the calculations and the institution that performed them. These aspects are discussed in more detail in Sørensen (1994a,c). But by operation of the models, it should be possible to simulate the system and forecast its performance both at a specified planning horizon and at intermediate time points.

After and during the modelling process and/or model evaluation is performed, ideas for the regulation and control of the problem probably will arise. Along with these suggestions for operational goals, the needed changes in the environment and the society can be specified. These can be discussed and analysed using the models, making sure that as many viewpoints as possible are considered and analysed (box no. 6). Since many environmental problems of today can be

characterised as regional or global, it is necessary to identify the aspects of solving the national problem that are dependent on actions taken in other countries. Therefore, contact should be taken with other countries concerned with common problem both in order to try to establish some sort of international action to be taken, and also to benefit from similar surveys that might possibly have been made within these countries (box no. 5). The nations could be addressed through already existing international cooperation networks or institutions. Depending on the plans of other nations, their effect on the problem solving also shall be assessed perhaps again by using the models. The process schematically presented by the box numbers 3, 4, and 6 can be carried out as an iterative process until some kinds of strategies can be expressed and documented satisfactorily.

After a certain time it should be possible to suggest the political goal for the plan (box no. 7). Perhaps this has already been expressed, and this step shall then merely be seen as a possible way to modify the political goals in accordance with the present state of knowledge. It is not up to the group to select a proper political goal for the plan, as this must be made by the politicians themselves. When the overall goal is stated, the already performed analyses can be used to simultaneously select the more operational terms connected with how the effects and changes on the system shall be defined and measured.

The problem-solving process now enters the *analysis phase*. At this point the first definitions related to strategies for achieving the goal can be made (box no. 8). Possible future system changes as a result of the various strategies shall be assessed—perhaps again using the models. In accordance with the level of credibility to the calculations and the present state of knowledge, the time frame for the overall goal can be set, as well as some intermediate time points for evaluating the effects of the strategies continuously. In this way the plan will be established based on a frame consisting of a number of possible sequential decisions and alternatives to be decided upon at future time points. The uncertainties in the basic figures, the assessment of the effects of the future changes of the system, etc., are thereby accounted for. The different possible strategies to put into force shall be proposed and analysed in terms of relevance and how well they fulfil the objectives of the plan.

Most often some effects of strategies are more desirable than others and some sort of setting of priorities must be made (box no. 9). The priority setting is mainly up to the decision makers themselves since this cannot necessarily be made using objective arguments. The selection of strategies is a highly subjective process where the goal and the effects of the strategies must be set in relation to each other. The priority setting can be a complicated process in itself. Explicit measures or weights on the different strategies can seldom be established. Also the strategies must be compared with other issues of society and the need for new strategies can therefore arise (back to box 8).

The output of the analysis will indicate what initial strategies are to be implemented into the plan. Before the final decision is made the strategies (as well as the documentation and arguments for them) shall be presented to the public at large (box no. 10). This serves two purposes. First it gives the public a chance to argue for or against the strategies, and thereby influence the decisions to be taken. Secondly, the presentation shall serve as a sort of public education. The problem shall be presented in understandable terms and the public shall be aware of the difficulties and necessities in taking action.

Finally, the results of the discussions and analyses shall be outlined as strategies in a plan that can be decided upon (box no. 11) by the politicians, and hopefully has a certain level of consensus in the whole society.

After the period of time it takes to implement the first strategies of the plan the

next strategy shall be decided on. As a basis for the new selection, new scientific, technical, and socially related knowledge should be used. In principle this means that the process as outlined in Figure 5.1 could be carried out again though in a less comprehensive way.

The planning and decision making in this way become an iterative process to reach general public consensus based on systematic ideas. The Dutch National Environmental Policy Plan has been developed on most of the principles outlined in the framework.

It should be mentioned that methods exist for coping with some of the stages described in the framework. In e.g., Rosenhead (1989) suggestions can be found for formulating conceptual models, for identifying and analysing alternative decisions and strategies, and for coping with group conflicts. Moreover, in Vidal (1990), computerised tools such as Decision Support Systems and the systems approach for decision making are extensively discussed.

It should also be mentioned that strategies similar to the one outlined here have been applied to real cases such as described in, for example, Rosenhead (1989 – Chapter 7), or in Zucchetto and Jansson (1985).

Recognising the time limits of such environmental problem solving, it is obvious that not all stages as outlined in the framework can be performed at equal levels of detail and comprehensiveness. Therefore it is suggested that the process be performed at two levels meaning that the problem is sought, described, and preliminary solved seen first from a broad angle, and later described and examined at a more detailed level. Etzioni (1967) refers to this idea as “mixed scanning”. Here the idea is referred to as “*the two-level planning approach*” and the overall ideas can be seen in Figure 5.2.

Two Level Planning Approach:

Level 1: Obtaining an overview

Level 2: Going into detail

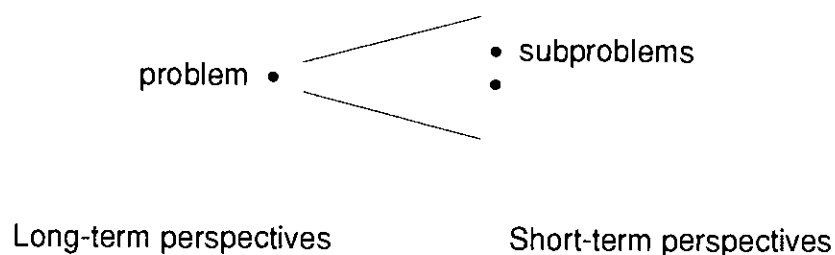


Figure 5.2. The ideas of the two-level planning approach.

Level 1 is intended for scoping the problem through a relatively fast working process (“fast” can refer to 1 or 2 years or even less depending on the urgency of the problems and the complexity of the situation). A general overview of the problem and its possible solutions can be established. This implies that the problem is to be structured (basically to find the borders of the problem area and perhaps identify subproblems), and the time frames found for solving it. The framework outlined in Figure 5.1 can be the basis for obtaining such an overview.

The outcome of this level 1 is intended to be a preliminary plan where the long-term overall goal is identified and formulated, and where the initial decision to reach this goal is made. This decision shall have only a range (in detail and time) corresponding to the level of scientific knowledge and the time it takes for implementing the decision. At the start of the implementation, the initial decision, research programmes (corresponding to the level 2 aspects) shall be initiated simultaneously in order to increase the level of scientific knowledge.

Basically, the aim of *level 2* is to increase the level of scientific knowledge, as level 1 scoping ends up with a number of subproblems on which additional information is needed. Level 2 of the "two-level planning approach" shall then be focused on going into detail. Level 2 probably will take more time, and therefore it is important that work on it take place simultaneously with the implementation of an initial decision. The level 2 survey focuses on detail and short-term perspectives corresponding to the points in time at which it is planned to evaluate the plan structure and determine a new strategy. In principle also the overall framework in Figure 5.1 can be utilised at this level. An alternative is to utilise principles of Environmental Impact Assessment (see, for example, Andersson *et al.*, 1991).

The structure of the Dutch National Environmental Policy Plan comes near the idea of "the two-level planning approach".

The approach and the methodological framework as outlined here do not address the elements of uncertainty directly, nor does the process as outlined here directly address the structural uncertainties either. The technical uncertainties are mostly dealt with through the multistrategy approach where various aspects are investigated through model analyses (scenario analyses). However, the technical uncertainties may need a more direct handling. Such aspects are considered in more detail in Sørensen (1993a,c). The sociopolitical uncertainties are dealt with only indirectly through the structuring of the process. Sociopolitical uncertainty elements arising on the basis of, e.g., human conflicts must be dealt with differently. Examples of how they can be handled methodologically can be found in Rosenhead (1989).

5.2 Summary

The experience of the presented environmental plans are here gathered into a framework for a systematic method for environmental problem solving.

The method is based on both a so-called two-level planning approach and a methodological framework that suggests how to perform the surveys of the levels. In principle the first level in the two-level planning approach is concerned with finding an overview of the problem, dividing the problem area into smaller units for closer investigation, and formulating the overall long-term goals of planning. Level 2 then focuses on going into detail in solving the smaller problems. This level specifically aims at analysing the problems and obtaining a short-term overview of their developments. The idea is to perform the level 2 work after a first outline of a plan has been presented and perform the detailed survey simultaneously with the implementation of the decisions.

The methodological framework on which to build the overview is based on aspects linking together those of the traditional problem-solving process. In this way the process becomes strongly based on cooperation among all groups of society, and a certain level of flexibility of the plan is secured.

The approach outlined mostly considers the structural uncertainties. More specific treatment of the technical and sociopolitical uncertainties may be needed.

6 Conclusion

This part of the thesis entitled "Environmental Planning and Uncertainty" has dealt with the problems of national environmental planning. The ratification process resulting in the Danish Water Action Plan has been presented as well as the major critique raised after the ratification. The Dutch National Environmental Policy Plan has likewise been presented here. This plan has been special because of the way it was formulated and the prestige it held prior to its ratification, but which ultimately led to the fall of the Dutch Government.

Presenting two such plans it is obvious that several similarities and equally as many differences exist in the way the plans of the two countries were developed and formulated. The fundamental similarities between the two plans are the likeliness in the structure of the problems to be solved, the timely urgency to finish the plans, and the number and origin of the uncertainty elements that influenced the two processes.

Both plans were a general request for immediate actions to be taken on environmental issues confronting the two countries at the present time and some time in the future. The Water Action Plan concentrated on one issue, namely, improving the water quality of the Danish waters, while the National Environmental Policy Plan focused on a series of environmental issues that under one should secure the environmental sustainability of the Netherlands. In spite of the different perspectives of the plans, the process for developing them addressed the same problems of locating causes and effects of the environmental problems, and finding proper strategies for solving them. Here the first striking difference between the plans come in. The process of developing the Water Action Plan can be characterised as a product of more or less random events forming a highly irrational planning process. The National Environmental Policy Plan was developed using a much more systematic approach in terms of securing the necessary basic scientific knowledge with a large level of credibility surrounding it. The process can be characterised as a structured and well-controlled process until a very late stage is reached immediately before the ratification. Subjective preferences and conflicts among the politicians then created a situation that was impossible to control and a new election was inevitable.

Timely perspectives pervaded the ratification processes severely. The Water Action Plan became a result of a decision-making process that lasted all in all less than 6 months during which the formulation of the overall goals and strategies were set in the first 6 weeks. This urgency was a result of public pressure and weak politicians who had no idea that environmental issues could be of such paramount importance. The process formulating the National Environmental Policy Plan was, as the author sees it reversed slightly. Here the politicians themselves were the instigators of a situation in which the prestige in formulating and implementing an overall comprising environmental plan was at a level where the government not was able to maintain the necessary political respect if large structural changes were to be imposed on the plan.

The elements of uncertainty, meaning the factors in the processes that could or did raise a degree of uncertainty about the decisions and their outcomes, are very closely connected to the criticism raised against the plans themselves. Almost no concern was put into managing the uncertainty elements of the process of the Water Action Plan. The only uncertainty type that was discussed (but not handled actively) was the technical perspectives of the basis calculations for the support and goal setting in the plan. The Water Action Plan was formulated in an inflexible way making it almost impossible to modify the strategies according to the future changes of circumstances in the society. In the ratification process of

the National Environmental Policy Plan, the uncertainty elements characterised as technical and structural types were handled in a way not influencing the process significantly. The special approach used in formulating the plan as a sort of framework that can be modified at future points in time built in a flexibility that enabled it to handle the uncertainties of the future.

Why the two plans were made and formulated with such large differences in structure and flexibility is an open question. The author believes that one major factor, namely, the RIVM is one explanation. RIVM's reputation, and prestige in the Netherlands and the rest of Europe gave a level of credibility for the necessary scientific information on which to base such a comprehensive plan. Such a level of credibility to the scientific data was far from present in the case of the Water Action Plan. The study indicates that scientific credibility has a tremendous influence on the political decisions. It stresses the importance of the usage of computer models, perhaps unavoidable in today's communities. Recognising the complexity of environmental decision making sets high demands to the problem-solving process as a whole—and to the way it seeks to limit the existing level of uncertainty. Only through this recognition of the limitations of the decision-making process, can a certain level of success of the process be secured.

It is also the conclusion of the study that most uncertainty elements can be dealt with through a systematic approach, and recognition of the potential influence of such elements if not dealt with. Of course no processes can be controlled completely—not in our every day lives and not in the policy-making processes in which environmental plans are formulated. And of course this level of control should not be the aim. The aim must be to be able to deal with the uncertainties that can be dealt with relatively easily and then set the strength on the unexpected events that always will occur. It cannot guarantee successful planning but can at least provide a certain sound basis as an alternative to "trial and error" planning.

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This report sets focus on the environmental planning and decision-making process as it takes place on a national level. Two examples of environmental planning of recent time have been the starting points for the report; the Danish Water Action Plan and the Dutch National Environmental Policy Plan. The processes are presented and analyzed. The complicated political ratification processes in the plans were exposed to many questions. The various critique points are discussed and utilized as basis for identification of different types of uncertainty; technical; structural; socio-political.

An alternative planning procedure has been proposed; the two level planning approach. This procedure gives an overview of how a specific environmental problem can be identified and structured from the presentation of the problem until a strategy has been found for solving this.

The report is the second part of the Ph.D. thesis on Environmental Planning and Uncertainty.

Descriptors INIS/EDB

DATA COVARIANCES; DECISION MAKING; DENMARK;
ENVIRONMENTAL IMPACTS; ENVIRONMENTAL POLICY;
IMPLEMENTATION; NETHERLANDS; PLANNING; WATER POLLUTION

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